Claims:

1. A device comprising:

a housing;

a receiver component, mounted within the housing, for receiving signals transmitted to the device;

a processor, mounted within the housing and operatively coupled to the receiver component, for processing signals received by the receiver component; and

a multi-functional piezoelectric transducer, electrically connected to the processor and mounted within the housing, for producing mechanical vibrations in response to electrical signals transmitted by the processor over a broad range of frequencies, said mechanical vibrations having sufficient force to generate a tactile alert at a predetermined first frequency, to generate an audible alert, and to generate audible sound over the audible frequency range.

2. The device of claim 1 wherein the processor further comprises a power supply for supplying a voltage sufficient to cause the multi-functional piezoelectric transducer to vibrate at the first predetermined frequency and at frequencies within the audible frequency range.

3. The device of claim 2 wherein the first predetermined frequency is less than approximately 300 Hz.

4. The device of claim 2 wherein the range of frequencies for audible alert is between approximately 300 Hz and 12,000 Hz.

5. The device of claim 2 further comprising an output, connected to the housing and operatively coupled to the processor, for visually displaying signals processed by the processor.

6. The device of claim 2 further comprising an amplifier, operatively coupled to the processor, for amplifying electrical signals transmitted by the processor before input to the multi-functional piezoelectric transducer.

7. The device of claim 2 further comprising a user control, operatively connected to the processor, for selecting the type of alert given to a user of the device.

8. The device of claim 1 further comprising a clamp, positioned at at least one end of the multi-functional piezoelectric transducer, for mounting the transducer within the housing.

9. The device of claim 8 wherein the multi-functional transducer is mounted in a cantilever fashion.

10. The device of claim 1 wherein the multi-functional piezoelectric transducer comprises a piezoceramic wafer.

11. The device of claim 10 wherein the piezoceramic wafer comprises at least one layer of lead zirconate titanate (PZT).

12. The device of claim 1 wherein the piezoelectric transducer is selected from the group consisting of a unimorph and a bimorph.

13. The device of claim 10 wherein the piezoelectric transducer is selected from the group consisting of a prestressed unimorph and a prestressed bimorph.

14. The device of claim 1 wherein the piezoelectric transducer further comprises at least one acoustic member attached to one side of the piezoelectric transducer.

15. The device of claim 14 wherein each acoustic member is positioned on an anti-node of the piezoelectric transducer.

16. A personal communication device comprising

a housing;

means, mounted within the housing, for receiving signals transmitted to the device;

means, mounted within the housing and operatively coupled to the means for receiving, for processing signals received by the means for receiving; and

means, operatively coupled to the means for processing and mounted within the housing, for producing mechanical vibrations, in response to electrical signals transmitted by the means for processing, over a broad range of frequencies, said mechanical vibrations having sufficient force to generate a tactile alert at a predetermined first frequency, to generate an audible alert, and to generate audible sound over the audible frequency range.

17. The device according to claim 16 further comprising a power supply, operatively coupled to the means for processing, for supplying a voltage sufficient to cause the means for producing mechanical vibrations to vibrate at the first predetermined frequency and at frequencies within the audible frequency range.

18. The device of claim 17 wherein the first predetermined frequency is less than approximately 300 Hz.

19. The device of claim 17 wherein the range of frequencies for audible alert is between approximately 300 Hz and 12,000 Hz.

20. The device according to claim 17 further comprising means, connected to the housing and operatively coupled to the processor, for visually displaying signals processed by the means for processing.

21. The device according to claim 17 further comprising means, operatively coupled to the processor, for amplifying electrical signals transmitted by the processor before input to the means for producing mechanical vibrations.

22. The device of claim 17 further comprising means, operatively connected to the processor, for controlling the type of alert selected by a user of the device.

23. The device of claim 16 further comprising a clamp, positioned at one end of the multi-functional means, for mounting the means for producing mechanical vibrations within the housing.

24. The device of claim 23 wherein the means for producing mechanical vibrations is mounted in a cantilever fashion.

25. The device according to claim 16 wherein the means for producing mechanical vibrations comprises a piezoceramic wafer.

26. The device according to claim 25 wherein the piezoceramic wafer comprises at least one layer of lead zirconate titanate (PZT).

27. The device according to claim 16, wherein the means for producing mechanical vibrations is selected from the group consisting of a unimorph and a bimorph.

28. The device according to claim 16 wherein the means for producing mechanical vibrations is selected from the group consisting of a prestressed unimorph and a prestressed bimorph.

29. The device according to claim 16 wherein the means for producing mechanical vibrations further comprises at least one acoustic member connected to one side of the means for producing mechanical vibrations.

30. The device according to claim 29 wherein the at least one acoustic member is positioned on an anti-node of the means for producing mechanical vibrations.

31. A device for producing mechanical vibrations in response to an electrical signal, comprising

a piezoelectric component having two opposing surfaces, said piezoelectric component further having at least two points where polarity is recognized; and

at least one acoustic member attached to one of the surfaces of the piezoelectric component.

32. The device according to claim 31, wherein the piezoelectric component comprises a unimorph piezoelectric structure having one piezoceramic wafer bonded between two metallic support layers.

33. The device according to claim 31, wherein the piezoelectric component comprises a bimorph piezoelectric structure having two piezoceramic wafers, each piezoceramic wafer being bonded to a different surface of a metallic support layer.

34. The device according to claim 32 wherein the piezoceramic wafer is made of lead zirconate titanate (PZT).

35. The device according to claim 33 wherein at least one piezoceramic wafer is made of lead zirconate titanate (PZT).

36. The device according to claim 31 further comprising a dampening material being positioned between the piezoelectric component and each acoustic member.

37. The device according to claim 36 wherein the dampening material substantially covers at least one surface of the piezoelectric component.

38. The device according to claim 31 wherein the piezoelectric component further comprises a neck region extending from one side of the piezoelectric component.

39. The device according to claim 38 further comprising a clamp, connected at the neck region of the piezoelectric component, for coupling the piezoelectric component to a base.

40. The device according to claim 31 wherein the piezoelectric component is coupled to a base in a cantilever fashion.

41. The device according to claim 31 further comprising means, positioned at one end of the piezoelectric component, for adjustably connecting the piezoelectric component to a base surface.

42. The device according to claim 31 wherein the at least one acoustic member comprises a surrounding wall portion having a bottom surface and a top surface, the surrounding wall portion extending along a direction substantially perpendicular from the bottom surface to the top surface, the bottom surface being operatively connected to the piezoelectric component.

43. The device according to claim 42 wherein the at least one acoustic member further comprises an end portion, operatively connected to the top surface of the surrounding wall portion, to form an enclosed chamber within the acoustic member when the bottom surface of the acoustic member is connected to the piezoelectric component.

44. The device according to claim 43 wherein the end portion has an orifice to form a passageway through the end portion to the chamber.

45. The device according to claim 31 wherein the mechanical vibrations are of sufficient force to produce audible sound at a predetermined frequency.

46. The device according to claim 31 wherein the mechanical vibrations are of sufficient force to produce audible sound over substantially the entire audible frequency range.

47. The device according to claim 31 wherein the mechanical vibrations are of sufficient force as to be readily felt by a holder of the device.

48. The device according to claim 31 wherein the mechanical vibrations are of sufficient force as to produce an audible alerting signal, a tactile alerting signal, and audible sound over substantially the entire audible frequency range.

49. The device according to claim 31, wherein the point of attachment of the at least one acoustic member is approximately at an anti-node of the piezoelectric component.

50. An article for producing sound comprising:

a surrounding wall portion having a bottom surface and a top surface, the surrounding wall portion extending along a direction substantially perpendicular from the bottom surface to the top surface, the surrounding wall portion having a thickness; and

an end portion, operatively connected to the top surface of the surrounding wall portion to define a surrounded area within the article, the end portion having a thickness, the end portion having an orifice to form a passageway through the end portion to the surrounded area.

51. An article for producing sound according to claim 50 wherein the surrounding wall portion is substantially cylindrical.

52. An article for producing sound according to claim 50 wherein the end portion is substantially circular.

53. An article for producing sound according to claim 50 wherein the surrounding wall portion is made of plastic.

54. An article for producing sound according to claim 50 wherein the end portion is made of plastic.

55. An article for producing sound according to claim 50, wherein the thickness of the surrounding wall portion is greater than the thickness of the end portion.

56. A device comprising:

a housing;

a receiver component, mounted within the housing, for receiving signals transmitted to the wireless or communication line device;

a processor, mounted within the housing and operatively coupled to the receiver component, for processing signals received by the receiver component;

an audible alerting component, mounted within the housing and operatively coupled to the processor, for vibrating at a predetermined first frequency so as to produce an audible, alerting sound; and

a multi-functional piezoelectric transducer, electrically connected to the processor and mounted within the housing, for producing mechanical vibrations, in response to electrical signals transmitted by the processor, over a broad range of frequencies, said mechanical vibrations having sufficient force to generate a tactile alert at a predetermined second frequency and to generate sound over the audible frequency range.

57. The device of claim 56 wherein the processor further comprises a power supply for supplying a voltage sufficient to cause the audible alerting component to vibrate at the first predetermined frequency and to cause the multi-functional piezoelectric transducer to vibrate at the second predetermined frequency and within the audible frequency range.

58. The device of claim 57 wherein the first predetermined frequency is in a range between approximately 300 Hz and 12,000 Hz.

59. The device of claim 57 wherein the second predetermined frequency is less than approximately 300 Hz.

60. The device of claim 57 further comprising an output, connected to the housing and operatively coupled to the processor, for visually displaying signals processed by the processor.

61. The device of claim 57 further comprising an amplifier, operatively coupled to the processor, for amplifying electrical signals transmitted by the processor before input to the audible alerting component and to the multi-functional piezoelectric transducer.

62. The device of claim 57 further comprising a user control, operatively connected to the processor, for selecting the type of alert given to a user of the device.

63. The device of claim 57 further comprising a clamp, positioned at one end of the multi-functional piezoelectric transducer, for mounting the transducer within the housing.

64. The device of claim 63 wherein the multi-functional piezoelectric transducer is mounted in a cantilever fashion.

65. The device of claim 57 wherein the multi-functional piezoelectric transducer comprises a piezoceramic wafer.

66. The device of claim 65 wherein the piezoceramic wafer comprises at least one layer of lead zirconate titanate (PZT).

67. The device of claim 57 wherein the multi-functional piezoelectric transducer is selected from the group consisting of a unimorph and a bimorph.

68. The device of claim 57 wherein the multi-functional piezoelectric transducer is selected from the group consisting of a prestressed unimorph and a prestressed bimorph.

69. The device of claim 57 wherein the multi-functional piezoelectric transducer further comprises at least one acoustic member attached to one side of the piezoelectric transducer.

70. The device of claim 69 wherein each acoustic member is positioned on an anti-node of the piezoelectric transducer.

71. A personal communication device comprising:

a housing;

a receiver component, mounted within the housing, for receiving signals transmitted to the device;

a processor, mounted within the housing and operatively coupled to the receiver component, for processing signals received by the receiver component; and

a multi-functional piezoelectric transducer, electrically connected to the processor and mounted within the housing, for producing mechanical vibrations in response to electrical signals transmitted by the processor over a broad range of frequencies, the multi-functional piezoelectric transducer comprising a piezoelectric component having two opposing surfaces, said piezoelectric component further having at least two points where polarity is recognized, the multi-functional piezoelectric transducer further comprising at least one acoustic member attached to one of the surfaces of the piezoelectric component, said at least one acoustic member forming a chamber after being attached to the surface of the piezoelectric component,

whereby said mechanical vibrations of the multi-functional transducer have sufficient force to generate a tactile alert at a predetermined first frequency, to generate an audible alert, and to generate audible sound over the audible frequency range.

72. A personal communication device comprising:

a housing;

a receiver component, mounted within the housing, for receiving signals transmitted to the device;

a processor, mounted within the housing and operatively coupled to the receiver component, for processing signals received by the receiver component;

a multi-functional piezoelectric transducer, electrically connected to the processor and mounted within the housing, for producing mechanical vibrations in response to electrical signals transmitted by the processor over a broad range of frequencies; and,

a clamp, positioned at one end of the multi-functional piezoelectric transducer, for mounting the transducer within the housing,

whereby said mechanical vibrations have sufficient force to generate a tactile alert, an audible alert, and audible sound over the audible frequency range.